National Institute of Environmental Health Sciences

Weather-related mortality: How heat, cold, and heat waves affect mortality in the United States

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Abstract:

BACKGROUND: Many studies have linked weather to mortality; however, role of such critical factors as regional variation, susceptible populations, and acclimatization remain unresolved. METHODS: We applied time-series models to 107 US communities allowing a nonlinear relationship between temperature and mortality by using a 14-year dataset. Second-stage analysis was used to relate cold, heat, and heat wave effect estimates to community-specific variables. We considered exposure timeframe, susceptibility, age, cause of death, and confounding from pollutants. Heat waves were modeled with varying intensity and duration. RESULTS: Heat-related mortality was most associated with a shorter lag (average of same day and previous day), with an overall increase of 3.0% (95% posterior interval: 2.4%-3.6%) in mortality risk comparing the 99th and 90th percentile temperatures for the community. Cold-related mortality was most associated with a longer lag (average of current day up to 25 days previous), with a 4.2% (3.2%-5.3%) increase in risk comparing the first and 10th percentile temperatures for the community. Mortality risk increased with the intensity or duration of heat waves. Spatial heterogeneity in effects indicates that weather-mortality relationships from 1 community may not be applicable in another. Larger spatial heterogeneity for absolute temperature estimates (comparing risk at specific temperatures) than for relative temperature estimates (comparing risk at community-specific temperature percentiles) provides evidence for acclimatization. We identified susceptibility based on age, socioeconomic conditions, urbanicity, and central air conditioning. CONCLUSIONS: Acclimatization, individual susceptibility, and community characteristics all affect heat-related effects on mortality.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Temperature

Temperature: Extreme Cold, Extreme Heat

Geographic Feature:

resource focuses on specific type of geography

Urban

Geographic Location: ☑

resource focuses on specific location

United States

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Injury

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Adaptation

Population of Concern: A focus of content

Population of Concern: ☑

populations at particular risk or vulnerability to climate change impacts

Elderly, Low Socioeconomic Status, Racial/Ethnic Subgroup

Other Racial/Ethnic Subgroup: African Americans

Resource Type: ☑

format or standard characteristic of resource

Research Article

Resilience: ☑

capacity of an individual, community, or institution to dynamically and effectively respond or adapt to shifting climate impact circumstances while continuing to function

A focus of content

Timescale: ☑

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content